

Preoperative Evaluation of Sesamoid Position in Patients with Hallux Valgus Deformity via Diagnostic Ultrasound: A Feasibility Study

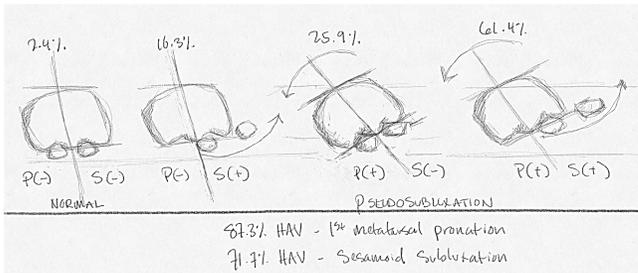
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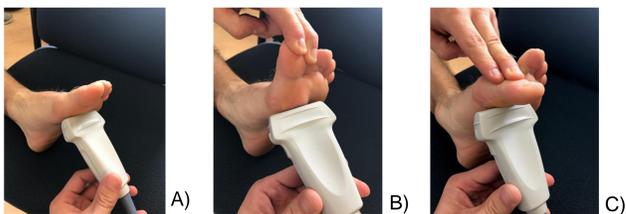
Introduction and Methodology

- Hallux abducto valgus (HAV), or “bunion”, is one of the most common deformities of the foot and ankle – with prevalence of 23% in groups aged 18-65 y/o and 36% in groups over the age of 65 y/o.
- Basic components of the deformity consist of first metatarsal varus (medial deviation), hallux valgus (lateral deviation), and sesamoid displacement/subluxation. Per Kim et al., 87% involve 1st metatarsal pronation and 72% involve sesamoid subluxation.
- Our initial goal was to establish a protocol utilizing ultrasound (US) to quickly, easily, and accurately image the 1st MTPJ and sesamoid apparatus that can differentiate a true sesamoid subluxation (when lateral release is warranted) from a pseudosubluxation preoperatively (when lateral release may actually be harmful).
- Protocol:**
 - US of 1st MTP in NP
 - US of 1st MTP in maximal DF*
 - US of 1st MTP in maximal PF
 - 15 – 30 sec dynamic video clip of 1st MTP ROM*
- Sesamoid position was assessed in relation to the 1st metatarsal head and crista.
- This position was then compared to the sesamoids on preoperative radiographs and positions were determined utilizing Hardy and Clapham’s method.



Procedure

- During preoperative visit patients who agreed to take part in the study and were scheduled for corrective HAV at the Weil Foot and Ankle Institute underwent sonographic imaging of the 1st MTPJ (Sonosite M-Turbo, 18 MHz).
- Sesamoid position was determined in real-time using US and later qualitatively compared to preoperative radiographs (AP and axial sesamoid)



- A) 1st MTPJ Neutral position
- B) 1st MTPJ in maximal dorsiflexion
- C) 1st MTPJ in maximal plantarflexion

Results

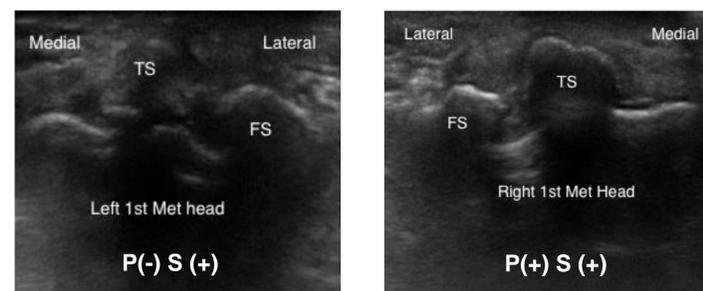
- Total of 10 patients were evaluated, with 8 participants having corresponding imaging data available for comparison.
- The WB AP radiographs showed an equal to or greater severity of potential sesamoid subluxation than US and/or SA images.

Patient #	US sesamoid position	AP sesamoid position	SA sesamoid position
1	3	4	~3-4
2	R: 2, L: 1-2	R: 3-4, L: 2	R: 2-3, L: 1-2
3	4	4	4
4	R: 4-5, L: 3	R: 5, L: 4	R: 4-5, L: 3
5	2	3	2-3
6	1	2	N/A
7	2	3	N/A
8	3	5	N/A

Anterior – Posterior (AP) Radiographs



Ultrasound (US) images



Sesamoid Axial (SA) Radiographs



Discussion

- An accurate understanding of sesamoid position and axial rotation of the 1st metatarsal is very important in the preoperative assessment of the HAV patient.
- According to Kim et al. approximately 28% of HAV patient's do not show sesamoid subluxation, and thus in a quarter of HAV patients lateral sesamoid release might be contraindicated and may cause more harm than good.
- With some studies showing up to 78% recurrence rates and up to 25% patient dissatisfaction post HAV correction, proper procedure selection including when to add a lateral soft tissue release needs to be more fully understood.
- In this preliminary work, we developed a protocol using US that was quick (avg. time was less than 3 min.) and accurate for differentiating true subluxation from a pseudosubluxation.
- Future work will want to:
 - Add a larger number of participants with varying foot-types.
 - Further evaluation of the US data – include metatarsal pronation angle analysis.
 - Add reliability testing for our new technique for experienced and inexperienced raters (i.e., reliability between and within raters).
 - Compare our ultrasound grading system to intra-operative sesamoid inspection and axial sesamoid radiographs.

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